8.3 Graphing Quadratic Functions in Standard Form
$y = ax^2 + bx + c$

1) $Graph: y = x^2 + 6x + 8$ Then state the domain and range.

Step 1: Find the vertex, AOS, and y-int. $a = 1, b = 6, c = 8$

Vertex: $x = \frac{-b}{2a} = \frac{-6}{2(1)} = \frac{-6}{2} = -3$
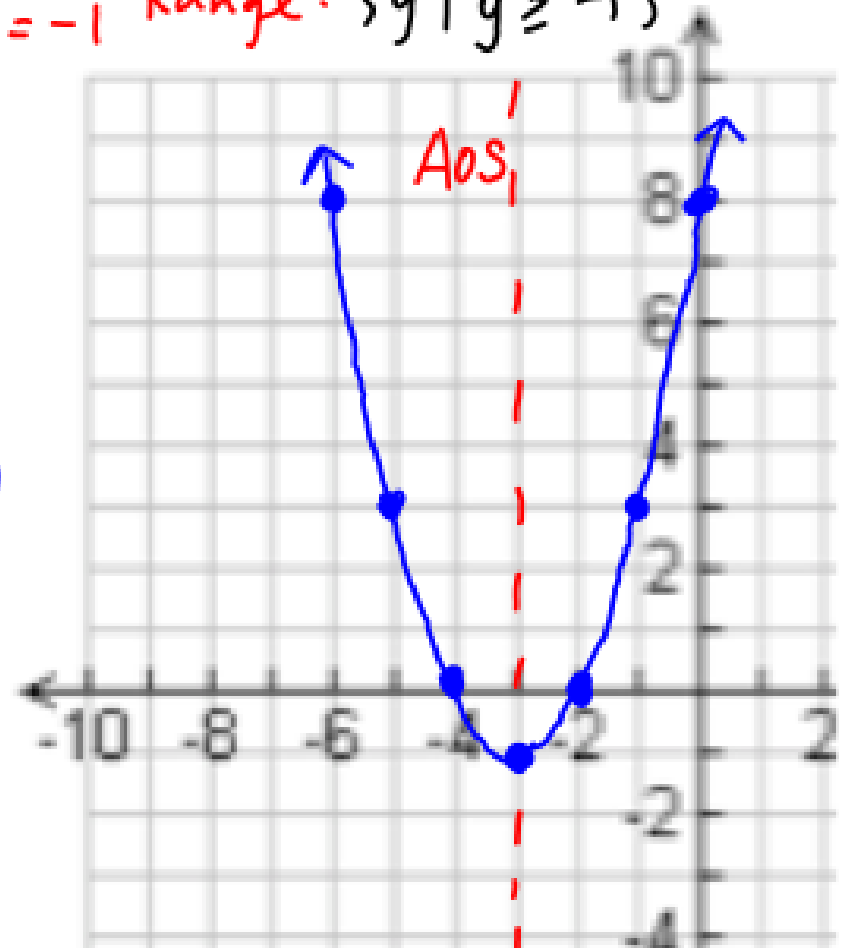
Domain: $\{x \mid x \in R\}$

$(-3, -1)$ $y = (-3)^2 + 6(-3) + 8 = 9 - 18 + 8 = -9 + 8 = -1$

1st

Range: $\{y \mid y \geq -1\}$

AOS: $x = -3$;   y-int: $(0, 8)$

Step 2: Create a table: (two number from the right of the x-vertex)

$\frac{x \mid y}{}$

$(-2 \mid (-2)^2 + 6(-2) + 8 = 4 - 12 + 8 = -8 + 8 = 0)$

$(-1 \mid (-1)^2 + 6(-1) + 8 = 1 - 6 + 8 = -5 + 8 = 3)$

Step 3: Graph AOS, plot the vertex, y-int., all the points, and use the AOS to find the corresponding points.

AOS

2) *Graph : $y - 4x = x^2 - 12$, then state the domain and range.*

Step 1: Find the vertex, AOF, and y-int.

Always put the equation into the standard form: $y = ax^2 + bx + c$

$y = x^2 + 4x - 12$; $a = 1$, $b = 4$, $C = -12$

Vertex: $x = \frac{-b}{2a} = \frac{-4}{2} = -2$

AOS: $x = -2$

Domain: $\{x \mid x \in R\}$

$(-2, -16)$ $y = (-2)^2 + 4(-2) - 12$

y-int : $(0, -12)$

Range: $\{y \mid y \geq -16\}$

$= 4 - 8 - 12 = -4 - 12 = -16$

Step 2: Create a table: (two number from the right of the x-vertex)

x	y
-1	$(-1)^2 + 4(-1) - 12 = 1 - 4 - 12 = -3 - 12 = -15$
0	-12

Step 3: Graph AOF, plot the vertex, y-int., all the points, and use the AOF to find the corresponding points.
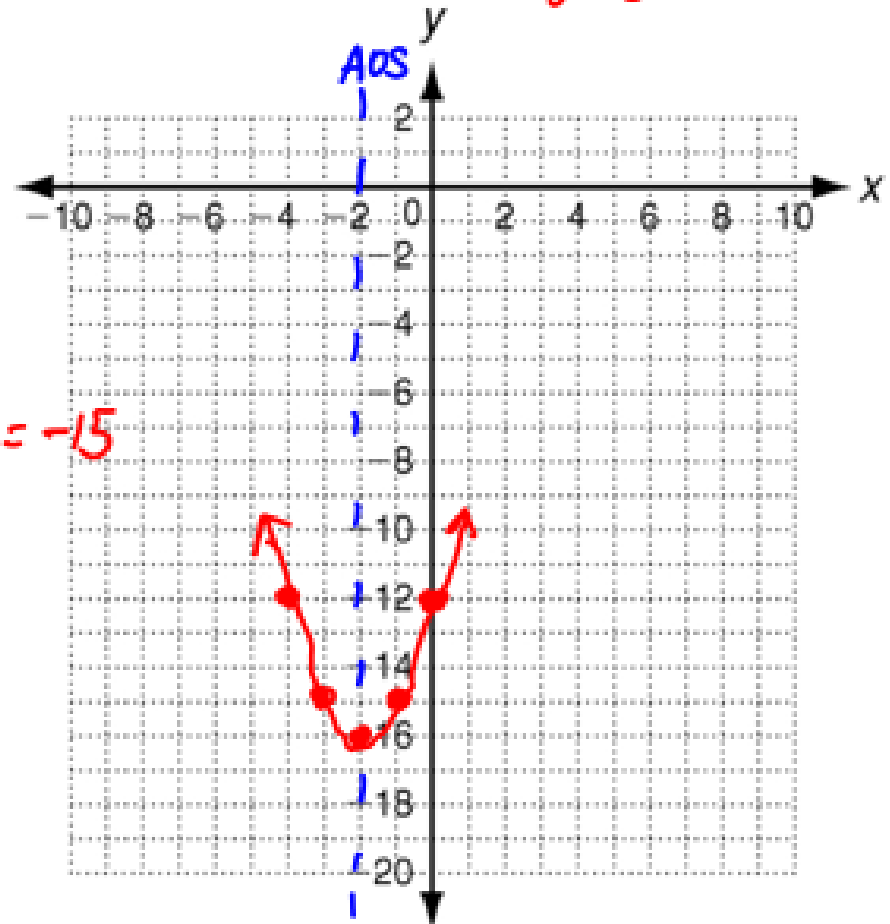
3) Graph: $y = 2x^2 + 4x - 3$, then state the domain and range.

$a = 2, \ b = 4, \ c = -3$

Vertex:

$(-1, -5)$ $\quad x = \dfrac{-b}{2a} = \dfrac{-4}{2(2)} = \dfrac{-4}{4} = -1$
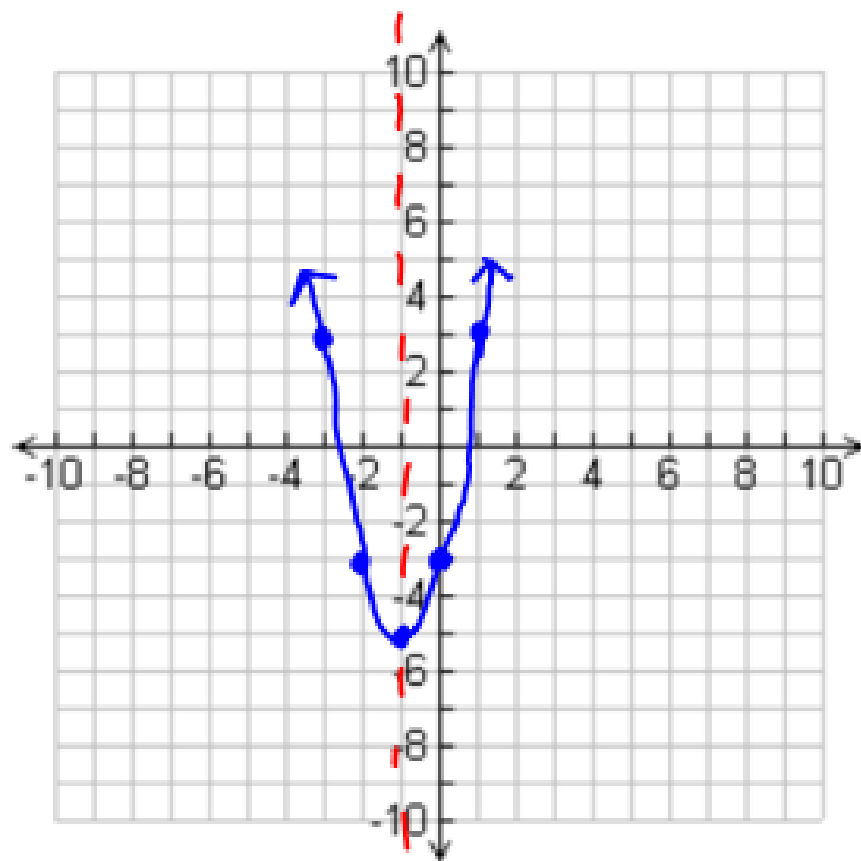
$y = 2(-1)^2 + 4(-1) - 3 = 2 - 4 - 3 = -5$

AoS: $x = -1$

y-int: $(0, -3)$

Domain: $\{x \mid x \in R\}$ Range: $\{y \mid y \ge -5\}$

table:

x	y
0	-3
1	$2(1)^2 + 4(1) - 3 = 3$

4) *Graph*: $y = -2x^2 - 8x + 1$, *then state the domain and range.*

$a = -2$, $b = -8$, $c = 1$

Vertex: $x = \dfrac{-b}{2a} = \dfrac{8}{2(-2)} = \dfrac{8}{-4} = -2$

$(-2, 9)$ $y = -2(-2)^2 - 8(-2) + 1$

$= -8 + 16 + 1 = 9$

AoS: $x = -2$; y-int: $(0, 1)$

Domain: $\{x \mid x \in \mathbb{R}\}$; Range: $\{y \mid y \le 9\}$

x	y
-1	$-2(-1)^2 - 8(-1) + 1 = -2 + 8 + 1 = 7$
0	1

AoS
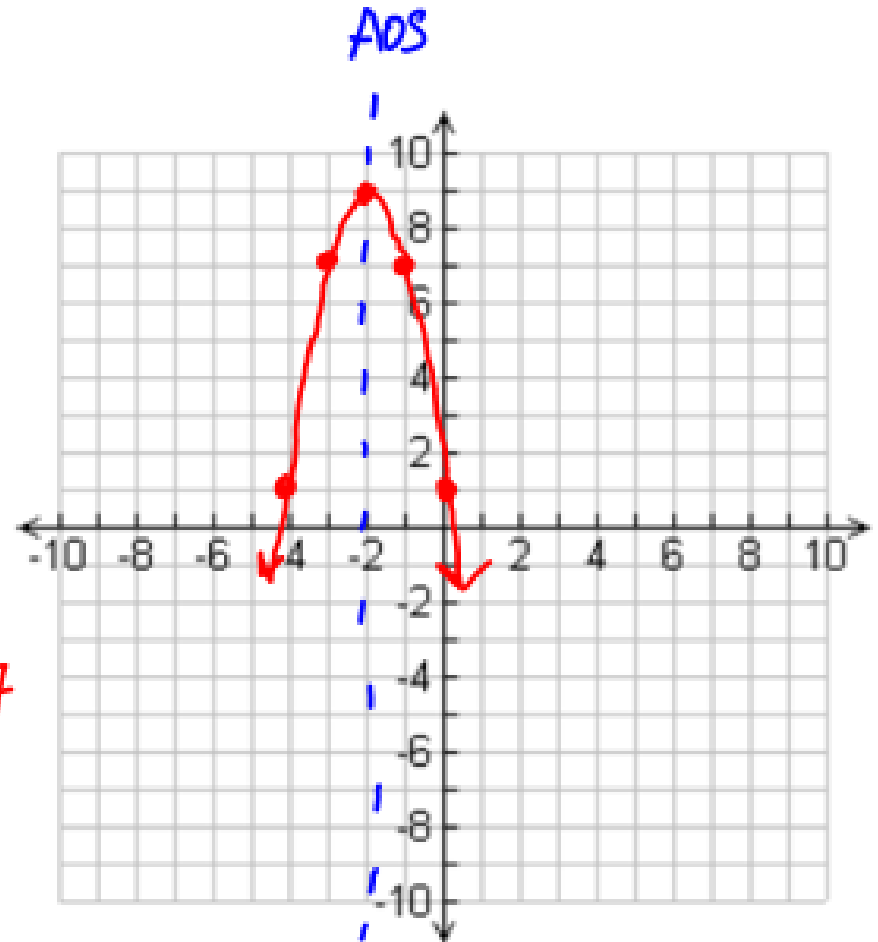
5) *Graph:* $y = 2x^2 + 4x - 2$, *then state the domain and range.*

$a = 2$; $b = 4$; $c = -2$

Vertex: $x = \dfrac{-b}{2a} = \dfrac{-4}{2(2)} = \dfrac{-4}{4} = -1$ Vertex: $(-1, -4)$

$y = 2(-1)^2 + 4(-1) - 2 = 2 - 4 - 2 = -4$

AoS: $x = -1$ y-int: $(0, -2)$

Domain: $\{x \mid x \in R\}$ Range: $\{y \mid y \geq -4\}$

table:

x	y
0	-2
1	$2(1)^2 + 4(1) - 2$
	$= 2 + 4 - 2 = 4$
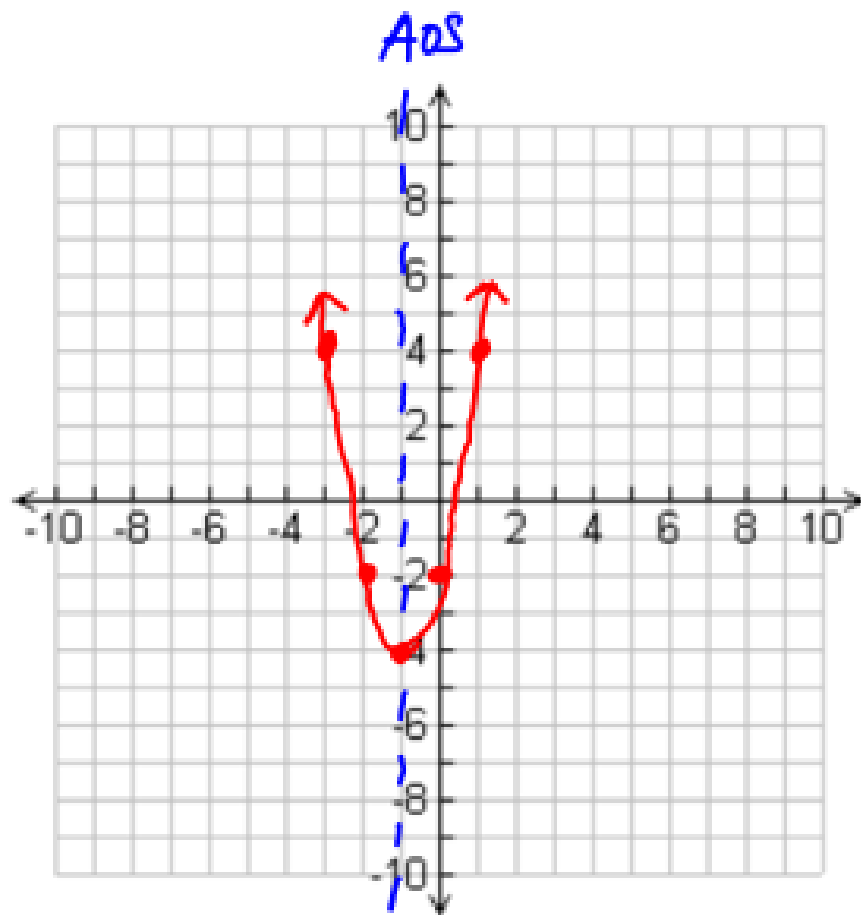
6) Graph: $y = -\dfrac{1}{2}x^2 + 2x + 3$, then state the domain and range.

$a = -\dfrac{1}{2}$, $b = 2$, $c = 3$

$x = \dfrac{-b}{2a} = \dfrac{-2}{2\left(-\frac{1}{2}\right)} = \dfrac{-2}{-1} = 2$

$y = -\dfrac{1}{2}(2)^2 + 2(2) + 3$

$= -2 + 4 + 3 = 5$

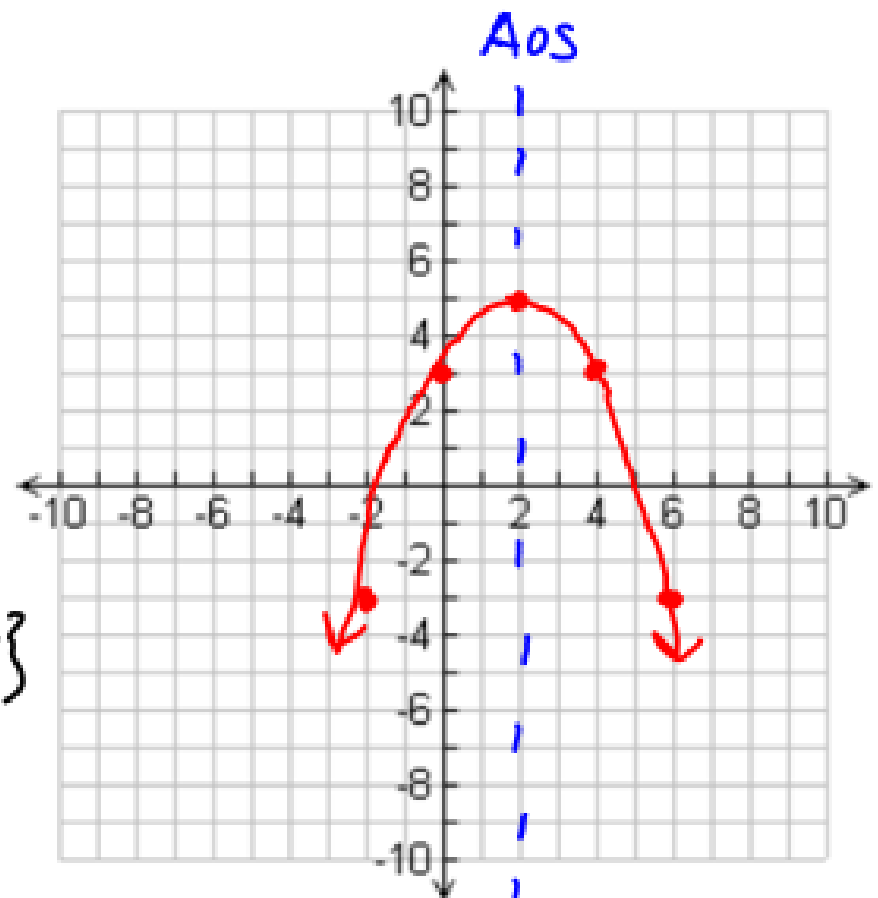Vertex: $(2, 5)$

AoS: $x = 2$, y-int: $(0, 3)$

Domain: $\{x \mid x \in \mathbb{R}\}$; Range: $\{y \mid y \leq 5\}$
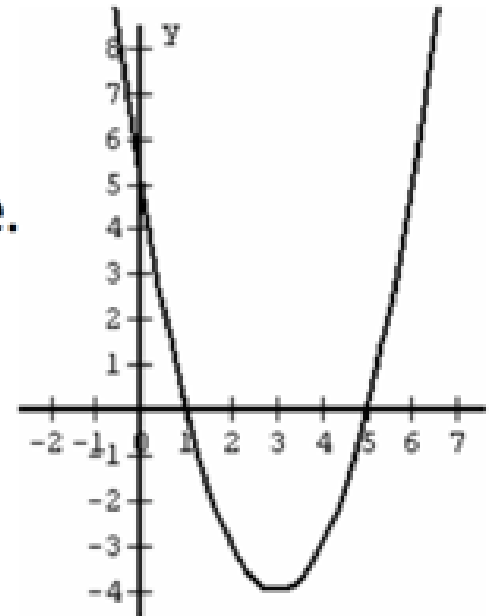
x	y
4	$-\dfrac{1}{2}(4)^2 + 2(4) + 3 = -8 + 8 + 3 = 3$
6	$-\dfrac{1}{2}(6)^2 + 2(6) + 3 = -18 + 12 + 3 = -3$

AoS

8.1 – 8.2 Review HW

1) Find the vertex, zeros, y-int, AOS, max/min, domain and range of the graph on the right.

2) Graph $y = 2x^2 - 2$. Then state the domain and range.

   $a = 2, \ b = 0$

3) Order the following from the widest to narrowest.

   $y = 2x^2, \ y = -4x^2, \ y = \frac{1}{2}x^2$

4) Find the vertex, AOS, and y-int of $y = 2x^2 - 4x + 5$.

5) What is the shape of the quadratic function graph called? How to tell a quadratic functions? How to tell whether the graph is open upward or downward? What's the domain of a quadratic function? How to find the max or min value.

   (y-value of the vertex)